Relationship Between Motherhood Status, Motherhood Desire, and Psychological Outcome Measures in Previvors, Women with Positive *BRCA1* and *BRCA2* Mutations

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Abstract

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Previvors are women who have not yet had breast cancer but have a known *BRCA1* or *BRCA2 (BRCA* will be used for both) mutation. Depression screening tools and cancer worry surveys are important markers of overall psychological wellbeing. In this study 298 previvor patient intake forms were examined to identify the relationship between motherhood status, motherhood desire and the psychological outcomes of cancer worry and depression specifically in women with *BRCA* mutations. The 9 question Patient Health Questionnaire (PHQ-9) and the Cancer Worry Scale (CWS) were the measures of psychological outcome. Quality assurance and data analyses were done in Excel and SPSS. Women with *BRCA1* mutations were more likely to desire children and were significantly younger than women with *BRCA2* mutations. In this study, 60.4% reported being a mother and 38.3% reported not being a mother and 92.3% of these women reported a family history of breast and/or ovarian cancer. There was no significant difference in psychological outcomes based on motherhood status and motherhood desire.

Dedication

To my very large and very supportive family, especially my patient husband, creative daughter, thoughtful son, and doting mom.

Introduction

Breast cancer is recognized as the most common cancer for women in the United States and the 2nd highest cause of cancer death, while ovarian cancer has the highest mortality rate of gynaecologic cancers (Siegel, Miller, & Jemal, 2017). On average women have a 12% chance (1 in 8 women) of having breast cancer during their lifetime (Velasquez-Manoff, 2015). However, for women found to have a pathogenic mutation in the *BRCA1* or *BRCA2* genes (*BRCA)* the risk of cancer increases to between 60% to 85% during their lifetime (Velasquez-Manoff, 2015). *BRCA1* and *BRCA2* mutations are also associated with an increased lifetime risk of ovarian cancer between 11% to 68% (Kuchenbaecker et al., 2017). As the second leading cause of death for women, breast cancer impacts many families.

Family is a complex term, but here we will talk about genetically related families. Motherhood can also have many meanings, but here we will use it to mean women who have children currently. For this work one can have a *motherhood status* of yes or no, meaning yes – one is a mother, or no – one is not a mother. The term *motherhood desire* will be used to mean women who want more children, regardless of their current motherhood status.

According to a Pew Research Center trend, in 2014, 85% of women aged 40-44 have given birth to at least one child which is up from 80% in 2005 (Livingston, Parker, & Rohal, n.d.). The average age of the women in our study was 40 years old. It is expected that many of the women finding out about their *BRCA* mutation status will have children or would have had children in the future depending on their age. The number of people waiting to have their first child after age 40 is increasing. One study, showed that 4% of the pregnancies in a given year were to women over age 40, which was 4 times more than 20 years ago (Rossin, 2019). However, the research does not seem to look at the impact of motherhood status or motherhood desire on these women's psychological outcomes.

Depression and cancer worry are two commonly used measures of psychological outcomes in women with BRCA mutations. A study about depression in workplace women found that women with children suffered less depression when faced with unpleasant work situations and that motherhood status and the number of children mediated these effects (Miner, Pesonen, Smittick, Seigel, & Clark, 2014).

Other research shows an increase in depression associated with age, but did not look at motherhood related effects (Stordal, Mykletun, & Dahl, 2003).

Cancer worry is a known concern in both previvors, or women with known *BRCA* mutations who have no personal history of breast cancer, and survivors, women who have had breast cancer and a *BRCA* mutations. However, much of the existing research about previvors focuses on navigating family planning and preventative measures (Dean & Rauscher, 2017; Lambertini et al., 2017). The research shows that these women worry about fertility more than their aged matched peers in addition to cancer worry(Dean & Rauscher, 2017; Getachew-Smith, Ross, Scherr, Dean, & Clements, 2019). Fertility is a major concern for many women with *BRCA* mutations. Existing studies involving women with breast cancer showed that more than 50% of women in reproductive years wish to maintain fertility (Bakkum-Gamez et al., 2011; Partridge et al., 2008).

This study will clarify the relationship between motherhood status, motherhood desire, and psychological outcomes in previvors. This relationship has not been previously been studied. This study is different from much of the existing work around breast cancer and fertility, because it looks at women coming into a multi-disciplinary clinic specifically for their *BRCA* mutation status rather than focused on their reproductive decision making. There is research around decision making regarding fertility and breast cancer survivors. However, there is very little information about how motherhood status and motherhood desire play into the psychological outcomes for previvors.

Methods

Study population

This research was conducted on an already existing set of data, women who were seen at the Breast and Ovarian Cancer Prevention Program (BOCPP) clinic between 2003 and 2016 for high risk of breast and/ or ovarian cancer who were entered into a research database. Women were referred to the BOCPP by their doctors or a self-referral. The referral occurred either due to a family history of breast

and/or ovarian cancer or due to genetic testing showing a positive mutation associated with an increased risk of breast and/or ovarian cancer. The BOCPP clinic is located in South Lake Union at the Seattle Cancer Care Alliance (SCCA). Eligibility criteria for participants were: a genetic test showing a deleterious mutation in *BRCA1* or *BRCA2* and no personal history of breast cancer.

Data collection

At or before a patient's first appointment at the BOCPP, they would receive patient intake forms by mail, email or both to complete. After the forms were completed and submitted, they were saved. The forms existed in PDFs on the local servers at the Seattle Cancer Care Alliance (SCCA). Data from the forms for the women with deleterious mutations in BRCA were transferred manually into REDCap (Research Electronic Data Capture) a secure, web-based database hosted at the University of Washington (Harris et al., 2019, 2009). REDCap allows for data entry with capabilities for validation, data manipulation, and data export. Entering the forms into REDCAP, allowed the questions of interest to be queried and downloaded in a deidentified manner.

Measures

Patient intake forms

The patient intake form was a six-page document containing a three page "Breast and Ovarian Cancer Prevention Program Intake History", and a three page, "Cancer Worry and Risk Scales". The variables motherhood status, motherhood desire, cancer worry, depression, family history of cancer, and several background variables were created or taken from questions in the patient intake form.

Motherhood status

Motherhood status was a yes/no variable that tells if a woman is a mother or is not a mother. Motherhood status was determined from a question in the reproductive history section, that asks "Number of Children (0=None)", with an open response answer. This was recoded in Excel so that 0 was recorded as "0" for no children, and any number greater than 0, was recorded as "1" for yes having children. Blank

responses were recoded into the system as missing. Number of children was also assessed from this question. So, the result was a yes, no, or missing response possible for the variable called "motherhood status and a number response for the variable "number of children".

Motherhood desire

Motherhood desire was a yes/no variable that tells if a woman wants more children or not. Motherhood desire was assessed from the patient intake survey question, "Are you planning to have more children?" The response choices where checkboxes for "yes", "no", or "undecided". These were recoded for descriptive statistics into yes = 1, no = 0 and undecided = 2. For analysis, "Undecided" and "yes" responses were combined, due to a low response rate for "undecided" (14.4%) and "yes" (14.4%). Additionally, it is believed that women who chose undecided were more likely to resemble women who wanted more children than women who did not want more children in regard to decision making and worry. The combined "yes"/ "undecided" option was coded as 1, "no" was coded as 0, and blank responses were recoded as system missing.

Breast cancer worry

Cancer worry was determined using the standard four questions from the Cancer Worry Scale (CWS)(Lerman et al., 1991). The four-question scale consists of, "Not at all or rarely" = 1, "Sometimes" = 2, "Often" = 3, and "Almost all the time" = 4. Scores on the CWS were summed and a total score was used for analysis. Scores were between 4 and 16. If a participant left any question unanswered that cancer worry score was not used.

Depression

The PHQ-9 is a 9 question pre-screening tool for depression (*Tool_phq9.pdf*, n.d.; Williams, 2014). The individual PHQ-9 responses were added together for a total PHQ-9 score. Questions were answered on a scale, where "Not at all" = 0, "Several Days" = 1, "More than half the days" = 2, and "Nearly every day" = 3. Participants received a total PHQ-9 score between 0 and 27. Table 1 shows the

breakdown of PHQ-9 scores and associated depression screening levels. If a participant left a question unanswered, but the first 2 questions were answered, then a PHQ-2 score was used. A PHQ-2 score of 3 or more out of 6 possible, is determined as cause for further depression screening. If a PHQ-2 was not possible then neither a PHQ-2 or PHQ-9 was calculated for that participant and they were excluded from the PHQ-9 analysis.

Table 1 Shows the screening recommendations by score

PHQ-9 Score Summary	
0-4	Minimal or no depression
5-9	Mild depression
10-14*	Moderate depression
15-19	Moderately severe depression
20-27	Severe depression

Table 1. *Mean PHQ-9 score for our sample was 14.66 (n =273, SD=6.704)

Family History of Cancer

The family history of cancer section on the patient intake form had a fillable table, where each line was for one relative. The form provided an option for the patient to choose a relative and the type of cancer. Each relative with a "yes" for breast or ovarian cancer was given a 1 for yes, family history of cancer. Each relative with a "no" for breast or ovarian cancer was given a 0 for no, family history of cancer, blank responses were coded as system missing. The final variable was a yes/no variable for a family history of cancer. Additionally, because the form provided the specific relative, a total count of first degree relatives and second degree relatives with breast and/or ovarian cancer was calculated.

Background information

Other background information was collected from several different questions in the patient intake form. Age was calculated using the patient birth date and appointment date. For age, the birth date was subtracted from the appointment date then divided by 365.25 and reported as whole year. For menopause status age was used. Age 50 and above was coded as 1 for "yes" having gone through menopause, and any age below 50 was coded as 0 for "no" not having gone through menopause. For the remainder of the background information the variables were all created where "yes" was coded as 1 and "no" as 0. Self-

reported financial hardship was ascertained from one question at the end of the survey, “Do you have any trouble with financial hardship that you would like to discuss?” Hysterectomy status was collected from a medical question asking if a hysterectomy had been performed. Another yes/no question asked if the patient was married or partnered.

Variable creation and data cleaning

After the information on the forms was entered REDCap, the data were exported into an excel spreadsheet. The excel spreadsheet contained deidentified information. The data directly from the forms were not entirely useable and required extensive data cleaning. The data were cleaned in the excel spreadsheet and prepared for uploading to SPSS. The data were loaded into SPSS for further data cleaning and data analysis.

Variables were created that matched the questions this study asked. Answers were coded so that they would be in dichotomous format (0 or 1 format) for analysis whenever possible. Variables like age and counts were left as continuous variables. A data dictionary was created listing all the variable names and the variable meaning.

Analysis

To ensure quality assurance amongst multiple data entry personnel and complicated multi category data points, 40 records were re-entered to confirm accuracy. This quality assurance analysis found that across 254 columns of data there was 95.85% agreement. When there was not agreement, it was primarily format related, for example the month 4 was considered different from the month 04.

Descriptive statistics were used to assess sample size and question completion rates. Descriptive statistics were also used to understand demographic information in order to describe the study population.

Linear Regression analyses were performed for continuous outcome variables to examine the relationship between cancer worry and depression and motherhood status and motherhood desire. Logistic Regression analyses were performed for our dichotomous outcome variables to examine the relationship

between motherhood status and motherhood desire and *BRCA* mutation type, cancer worry, and depression. Statistical significance was looked for at a $p<0.05$ value.

Two tailed t test was performed to look at the differences between women with *BRCA1* and *BRCA2* mutations. This test looked for a significant ($p<0.05$) difference in the means for motherhood status, motherhood desire, number of children, partner status, hysterectomy status, menopause status, age, family history cancer, cancer worry scale score, 9 question depression screening score, 2 question depression screening score, and self-reported financial hardship. If a patient did not answer a specific question, they were still included in analyses for other questions in order to not bias the sample by removing women who may be different from women who answered the question.

Results

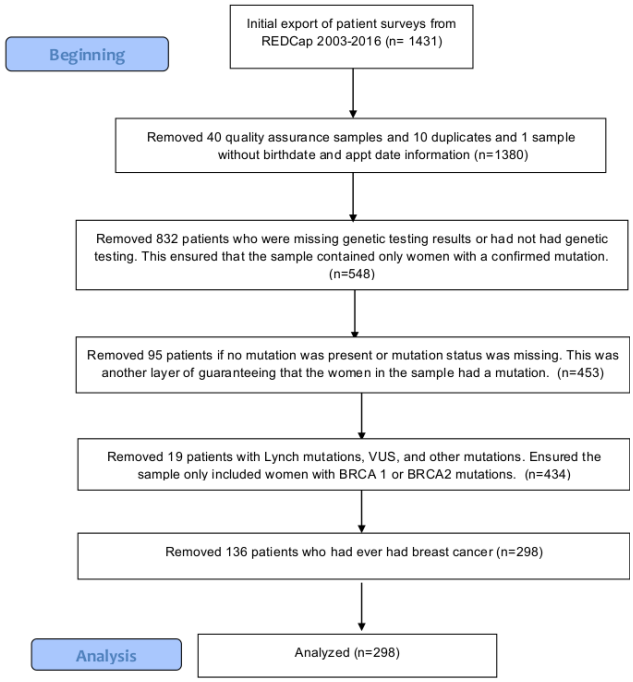

Figure 1. Flow chart of inclusion/exclusion process

From the 1431 original patient intake forms, 298 patient forms were used in the analysis. These women aged 18-79 (mean age: 39.22) whose patient intake forms (forms) were used in this study, met the criteria displayed in Figure 1.

Table 2 describes background demographic data for these women. The average age of participants was 39.22 years. Most women, 62% had not gone through menopause. Of the women 71% reported being married or partnered, while 29% reported being single, and 2.7% (n=8) were missing a response. The women had either BRCA1, 56%, or BRCA2, 44%, mutations. Of the women that answered about hysterectomy, 20.8% reported having had a hysterectomy, 38.3% reporting no hysterectomy, and 40.9% (n=122) missing a response. Only 12.4% reported financial hardship, 58.4% reported no financial hardship, and 29.2% (n=87) had no answer.

Table 2 Descriptive statistics for population (n= 298)

Variable	% of total	N
Age (M: 39.22, SD: 11.80)	100	298
Motherhood status	98.7	294
Yes	60.4	
No	38.3	
Missing	1.3	
Motherhood desire	83.6	249
Yes	14.4	
Undecided	14.4	
No	54.7	
Missing	16.4	
Number of children (M: 1.22, SD: 1.19)	98.7	294
BRCA1	56.0	167
BRCA2	44.0	131
Married or Partnered	97.3	290
Yes	79.1	
No	28.2	
Missing	2.7	
Menopause status	100	298
Yes	37.6	
No	62.4	
Missing	0	
Hysterectomy status	59.1	176
Yes	20.8	
No	38.3	
Missing	40.9	
Family history of breast and ovarian cancer	94.0	280
Yes	92.3	
No	1.7	
Missing	6.0	
Number of fdr with cancer		198
1 fdr	30.9	
2 or more fdr	35.6	
Missing fdr	33.6	
Number of sdr with cancer		200
1 sdr	8.1	
2 or more sdr	59.1	
Missing sdr	32.9	
Financial hardship	70.8	211
Yes	12.4	
No	58.4	
Missing	29.2	
phq9 score (M: 14.66, SD: 6.70)	91.6	273
phq2 score (M: 3.21, SD: 1.72)	96.0	286
Cancer worry score (M: 8.31, SD: 2.96)	97.7	291

Fdr- first degree relative, sdr- second degree relative

Of the participants, 60.4% reported being a mother (having at least one child), 38.3% reported not being a mother (not having children), and 1.3%(n=4) did not have an answer. Only 14.4% of participants reported wanting more children, 54.7% reported not wanting more children, 14.4% were undecided, and 16.4% (n=49) had no reported answer. In this group of women 92.3% reported a family history of breast and ovarian cancer in first, second, and third degree relatives, only 1.7% reported no family history of breast and ovarian cancer, and 6% (n=18) did not answer the question.

Family history of cancer can be further broken down into first-degree relatives (fdr) and second degree relatives (sdr). First degree relatives are biological mother, father, full-siblings, and children. Second degree relatives are biological grandparents, aunts, uncles, nieces, nephews, grandchildren, and half-siblings. In this population 66.4% of participants had at least one fdr with breast and/or ovarian cancer and 67.1% had at least one sdr with breast and/or ovarian cancer. Of the participants with fdr with cancer, 53.5% had 2 or more fdr with cancer. Of the participants with sdr with cancer, 88% had 2 or more sdr with cancer.

Table 3 compares the 298 women by *BRCA* mutation type. This allows us to see if the women in the two testing groups are significantly different. A two tailed t-test was conducted to compare motherhood status, motherhood desire, number of children, partner status, hysterectomy status, menopause status, age, family history of caner, number of fdr and sdr, cancer worry scale score, 9 question depression screening score, 2 question depression screening score, and self-reported financial hardship in women with *BRCA1* and women with *BRCA2* mutations (Table 3). There was a significant difference in the scores for motherhood status, motherhood desire, age, menopause status, partner status, number of children, motherhood status, and motherhood desire. However, there was not a significant difference in scores for hysterectomy status, cancer worry, financial hardship, neither depression screening, nor family history of cancer. These results suggest that women with *BRCA1* mutations are younger, fewer are mothers, they want more children, and they have less children than women with *BRCA2* mutations.

Table 3 Comparison of key variables by *BRCA1* and *BRCA2* mutation (n= 298)

	BRCA1(Std Dev)	*BRCA2*(Std Dev)	Total (n=298)
N	167	131	
Motherhood status (%yes)	55**	69**	61 (n=294)
Motherhood desire (%yes)	44*	23*	35 (n=249)
Number of children (mean)	1.07(1.17)**	1.42(1.20)**	1.22 (n=294)
Partner status (%yes)	63*	81*	71 (n=290)
Hysterectomy status (%yes)	33	37	35 (n=176)
Menopause status (%yes)	33*	44*	38
Age (mean)	36.65(10.15)*	42.49(12.83)*	39.22
Family history of cancer (%yes)	97	99	98 (n=280)
Cancer worry score (mean)	8.38 (2.98)	8.22(2.94)	8.31 (n=291)
9 question depression screening score (mean)	14.63(6.83)	14.70(6.57)	14.66 (n=273)
2 question depression screening score (mean)	3.17(1.71)	3.27(1.75)	3.21 (n=286)
Self-reported financial hardship (%yes)	19	16	18 (n=211)

*significant difference <=0.01, **significant difference <0.02

Table 4 shows correlations between demographic and study variables. Motherhood status was significantly associated with motherhood desire, age, menopause status, hysterectomy status, number of children, partner status, and *BRCA* status. Motherhood desire was significantly associated with age, menopause status, hysterectomy status, number of children, partner status, number of FDR with cancer and *BRCA* status. Age was significantly associated with motherhood status, motherhood desire, menopause status, hysterectomy status, number of children, partner status, family history of cancer, number of FDR, and *BRCA* status. Menopause status was significantly associated with motherhood status, motherhood desire, age, hysterectomy status, number of children, family history of cancer, and number of FDR. Hysterectomy status was significantly associated with motherhood status, motherhood desire, age, number of children, family history of cancer, and number of FDR. Number of children was significantly associated with motherhood status, motherhood desire, age, menopause status, hysterectomy status, family history of cancer, and number of FDR. Partner status was significantly associated with motherhood status, motherhood desire, age, number of children, financial hardship, and *BRCA* status. Cancer worry was significantly associated with depression and financial hardship. Depression was significantly associated with cancer worry and financial hardship. Family history of cancer was significantly associated with age, menopause status, and hysterectomy status. Number of fdr was

significantly associated with motherhood desire, age, menopause status, hysterectomy status, and number of sdr. Number of sdr was only significantly associated with number of FDR. Financial hardship was significantly associated with partner status, cancer worry, and depression. *BRCA* status was significantly associated with motherhood status, motherhood desire, age, number of children, and partner status.

Table 4 Correlations between study variables

	Motherhood status	Motherhood desire	Age	Menopause status	Hysterectomy status	Number of children	Partner Status	Cancer Worry	Depression	Family Hx of Cancer	Number of FDR	Number of SDR	Financial hardship	*BRCA* status
Motherhood status	-													
Motherhood desire	-.432**	-												
Age	.415**	-.616**	-											
Menopause status	.317**	-.397**	.612**	-										
Hysterectomy status	.246**	-.502**	.647**	.784**	-									
Number of children	.818**	-.448**	.426**	.307**	.298**	-								
Partner status	.444**	-.221**	.229**	.065	.070	.384**	-							
Cancer worry	.060	-.023	.037	-.094	-.100	.024	.077	-						
Depression	.056	-.085	.097	-.015	-.015	.032	.071	.551**	-					
Family History of Cancer	.057	.096	-.145*	-.174**	-.243**	.047	-.024	.107	-.050	-				
Number of FDR	.105	-.257**	.287**	.236**	.187*	.086	.051	.020	.114	.c	-			
Number of SDR	.107	-.060	.023	.090	.035	.118	.052	-.033	-.037	.c	.224**	-		
Financial hardship	.010	-.069	.032	.027	.030	.064	-.138*	.193**	.148*	.057	.057	.108	-	
BRCA status	.146*	-.227**	.247**	.108	.042	.148*	.198**	-.026	.005	.068	-.054	-.119	-.046	-

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed).
c. Cannot be computed because at least one of the variables is constant.

Regression models

Multiple logistic regressions were performed to look at the effects of cancer worry, depression, age, menopause status, number of children, partner status, financial hardship and total number of fdr and sdr with cancer on motherhood status and motherhood desire. Table 5 shows the best models for motherhood status and motherhood desire. Full models including all variables were run and then using backward selection the best models were reported. Best was determined by the models explaining the most variance (Nagelkerke R^2) and which had the highest percentage of correctly classified cases.

Table 5 Logistic regression models showing contributing factors to motherhood status and motherhood desire

Model	Predictor	B	SE	Wald	P value	Exp(B)
Motherhood status	Age	.009	.026	.118	.731	1.009
	Partner status*	-1.889	.471	16.096	.000	.151
	Cancer worry	.107	.100	1.164	.281	1.113
	Depression	-.033	.047	.495	.482	.967
	Motherhood desire*	1.784	.551	10.492	.001	5.954
	Total number of fdr	.071	.216	.107	.744	1.073
	BRCA	.104	.433	.058	.810	1.110
Motherhood desire	Age*	-.348	.070	24.768	.000	.706
	Motherhood status	-.536	1.138	.221	.638	.585
	Number of children*	-1.454	.539	7.270	.007	.234
	Partner status	-.852	.905	.886	.347	.427
	Cancer worry	.009	.133	.005	.945	1.009
	Depression	.044	.060	.539	.463	1.045
	Total number of fdr*	-.878	.416	4.469	.035	.415

*significant at p <.05, fdr is first degree relatives

The overall model for motherhood status was statistically significant $\chi^2(7) = 48.555$, $p = .000$ and explained 36.9% of the variance, as well as correctly classifying 75.2% of participants motherhood status. The overall model for motherhood desire was statistically significant $\chi^2(8) = 127.757$, $p = .000$ and explained 76.1% of the variance, as well as correctly classifying 88.5% of participants motherhood desire.

Table 6 shows two linear regressions that were run. Pairwise deletion was used. The first linear regression was run to see the effects on depression of motherhood status, motherhood desire, number of children, financial hardship, number of first degree or second degree relatives with cancer, age, partner status, menopause status, and *BRCA* mutation type on depression. These variables did not significantly predict depression, F (10,125) = 1.072, p = 0.389, $r^2 = 0.079$.

The second linear regression was run to see the effects on cancer worry of motherhood status, motherhood desire, number of children, financial hardship, number of first degree or second degree relatives with cancer, age, partner status, menopause status, and *BRCA* mutation. These variables did not significantly predict depression, F (10, 125) = 0.797, p = 0.632, $r^2 = 0.060$.

Table 6 Two linear regression models showing relationship between depression, cancer worry and study variables.

	B	Std Error	P Value	R^2
Depression Model			0.632	0.060
Motherhood Status	.972	2.166	.654	
Motherhood desire	-.325	1.631	.842	
Number of Children	-.477	.872	.586	
Financial Hardship	2.849	1.567	.974	
Total fdr	.702	.634	.271	
Total sdr	-.315	.380	.409	
Age	.066	.076	.389	
Partner status	1.093	1.480	.462	
Menopause status	-1.595	1.548	.305	
BRCA mutation type	-.324	1.247	.795	
Cancer Worry Model			0.389	.079
Motherhood Status	.788	. 946	.406	
Motherhood desire	.118	.713	.869	
Number of Children	-.274	.381	.473	
Financial Hardship	1.677	.684	.071	
Total fdr	.056	.277	.841	
Total sdr	-.106	.166	.524	
Age	.034	.033	.309	
Partner status	.575	.647	.375	
Menopause status	-1.109	.676	.103	
BRCA mutation type	-.302	.545	.580	

Fdr – first degree relative, sdr – second degree relative

Discussion

This study looked to identify the relationship between motherhood status, motherhood desire and psychological outcomes such as cancer worry and depression in women with *BRCA* mutations. A retrospective analysis was performed on this population and found that there is no difference in women's cancer worry or depression based on motherhood desire or motherhood status. Although, it is known that previvor women with *BRCA* mutations worry about their fertility, this worry does not seem to differ significantly based on whether they are already a mother or their desire for children (Hamilton 2010).

However, this study did find that in women presenting to this specialty clinic, previvor women with *BRCA1* mutations are younger than previvor women with *BRCA2* mutations. In addition to being younger, women with *BRCA1* mutations are less likely to be mothers, more likely to want children, have fewer children, have not gone through menopause, and less likely to be married or in committed relationship. All of these findings are associated with a younger population.

The data suggest that there are multiple variables that contribute to motherhood status and motherhood desire. For motherhood status the biggest predictor of being a mother, was being married or

in a committed relationship and not wanting more children. For motherhood desire the biggest predictors in the model were age, number of children, and total number of fdr with cancer. A woman with a *BRCA* mutation was more likely to want children if she was younger, had fewer children, and fewer first degree relatives with cancer. This suggests that women with *BRCA* mutations are either consciously or unconsciously taking family history of cancer into account when considering family planning.

This research could be important to the medical community for informing care decisions, as well as to those with *BRCA* mutations in how motherhood status and motherhood desire impact understanding their own depression and cancer worry. There seems to be an opportunity for more focused attention on family planning not just for women with breast cancer, but for those who know they have a *BRCA* mutation.

This study found that previvor women with *BRCA1* mutations are younger than previvor women with *BRCA2* mutations. Other research shows that women with *BRCA1* mutations usually have an earlier onset of cancer than women with *BRCA2* mutations. So, more research is needed to see if there is reproducibility of these results in a more generalizable population.

It would be valuable to interview women and ask more specific questions about motherhood status and motherhood desire. Additionally, this study did not have enough information about race nor socioeconomic status, which could contribute to motherhood status, motherhood desire, cancer worry, and depression. It would also be helpful in the future to look at motherhood status and motherhood desire in previvors, survivors, and women without *BRCA* mutations.

The population of women who seek care at the BOCPP are not a representative sample of all women who have a *BRCA* mutation and as such this study cannot be generalized. However, it is a good starting point. There may be something systematically different about women who choose not to answer questions about motherhood status or motherhood desire. The intake survey had slight changes in questions during the time period of the study, which could change answers over time. The changes were

made to make the questions clearer, but this could make it harder to compare earlier and later survey answers.

In summary, this study looked at a population of previvor women with *BRCA* mutations to see if there was a relationship between motherhood status, motherhood desire, and cancer worry and depression. Two statistically significant models were created that explain some of the factors influencing women wanting children and women having children. A number of differences between women with *BRCA1* and *BRCA2* mutations were found, to include women with *BRCA1* mutations are more likely to desire children, but this may be due to them being younger on average than women with *BRCA2* mutations.

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